

ExMax ¼ turn actuators – size M

ExMax - ... - Y
ExMax - ... - YF
ExMax - ... - CTM

Subject to change!

Electrical, explosion proof rotary actuators

3-pos. / 0...10 VDC / 4...20 mA control mode, with feedback, 24...240 VAC/DC, 95° angle of rotation

50/75 Nm, 100 Nm without and 30 Nm, 50 Nm with safety operation (spring return)

ATEX tested in acc. with directive 2014/34/EU for zone 1, 2, 21, 22

Compact. Easy installation. Universal. Cost effective. Safe.

Type	Torque	Supply	Motor running time	Spring return	Control mode	Feedback	Wiring diagram
ExMax- 50.75 - Y	50 / 75 Nm	24...240 VAC/DC	40 / 60 / 90 / 120 / 150 s/90°	–	3-pos., 0...10 VDC, 4...20 mA	0...10 VDC, 4...20 mA	SB 4.0+4.1
ExMax-100 - Y	100 Nm	24...240 VAC/DC	40 / 60 / 90 / 120 / 150 s/90°	–	3-pos., 0...10 VDC, 4...20 mA	0...10 VDC, 4...20 mA	SB 4.0+4.1
ExMax- 30 - YF	30 Nm	24...240 VAC/DC	40 / 60 / 90 / 120 / 150 s/90°	~ 20 s/90°	3-pos., 0...10 VDC, 4...20 mA	0...10 VDC, 4...20 mA	SB 4.0+4.1
ExMax- 50 - YF	50 Nm	24...240 VAC/DC	40 / 60 / 90 / 120 / 150 s/90°	~ 20 s/90°	3-pos., 0...10 VDC, 4...20 mA	0...10 VDC, 4...20 mA	SB 4.0+4.1
ExMax- ... - CTM	Types as above with aluminium housing and seawater resistant coating (cable glands brass nickel-plated)						

Product views and applications

Safety damper



Ball valve



Throttle valve



Description

The ExMax actuators are a revolution for safety, control and shut-off dampers, VAV systems, ball valves, throttle valves and other motorized applications for HVAC systems in chemical, pharmaceutical, industrial and offshore/onshore plants, for use in Ex-areas zone 1, 2 (gas) and zone 21, 22 (dust).

Highest protection class (ATEX) and IP66 protection, small dimensions, only 9,5 kg weight, universal functions and technical data, an integrated heater and an optional stainless steel housing guarantee safe operation even under difficult environmental conditions. High quality brushless motors guarantee long life.

All actuators are programmable and adjustable on site. Special tools or equipment are not required. Motor running times and torques as well as spring return times, according to the actuator type, are selectable or adjustable on site. The integrated universal power supply is self adaptable to input voltages in the range of 24...240 VAC/DC. Furthermore it is possible to perform control signal inverting and compulsion control by certain connections. The actuators are 100 % overload protected.

...Max-...-YF actuators are equipped with spring return fail safe function. Standard shaft connection is a double square direct coupling with 16 x 16 mm.

Different accessories are available to adapt auxiliary switches, terminal boxes or adaptations for ball valves and throttle valves and other armatures.

Highlights

- ▶ For all types of gas, mists, vapours and dust for use in zone 1, 2, 21 and 22
- ▶ Universal supply unit from 24...240 VAC/DC
- ▶ 5 different motor running times 40–60–90–120–150 s/90°, adjustable on site
- ▶ 2 different spring return running times ~ 20 s/90°, selectable on site
- ▶ 3-pos. and 0...10 VDC, 4...20 mA control mode with or without spring return function
- ▶ Feedback signals 0...10 VDC and 4...20 mA
- ▶ Reverse function
- ▶ 30–50–75–100 Nm actuators in the same housing size
- ▶ 100 % overload protected
- ▶ Compact design and small dimension (L x W x H = 288 x 149 x 116 mm)
- ▶ Direct coupling to the damper shaft with double square connection 16 x 16 mm
- ▶ 95° angle of rotation inclusive 5° pretension
- ▶ Robust aluminium housing (optional with seawater resistant coating)
- ▶ IP66 protection
- ▶ Simple manual override included + preparation for comfortable manual override
- ▶ Gear made of stainless steel and sinter metal
- ▶ Weight only ~ 9,5 kg
- ▶ Integral heater for ambient temperatures down to -40 °C
- ▶ Integral safety temperature sensor
- ▶ Integral equipment for manual adjustment (push button, lamp, switch)
- ▶ Preparation for adaptable and adjustable auxiliary switches type ...Switch
- ▶ Wide range of accessories



Technical data	ExMax- 50.75 -Y	ExMax- 100 -Y	ExMax- 30 -YF	ExMax- 50 -YF
Torque motor (min.)	50 / 75 Nm selectable on site	100 Nm	30 Nm	50 Nm
Torque spring (F)	without F	without F	min. 30 Nm	min. 50 Nm
Dimension of external torque	Above mentioned torques are min. torques in blocked position, external torque should be max. 80 % of max. actuator torque but min. 10 Nm			
Supply voltage / frequency	24...240 VAC/DC, $\pm 10\%$, self adaptable, frequency 50...60 Hz $\pm 20\%$			
Power consumption	max. starting currents see ① Extra information (in acc. with voltage, $I_{start} \gg I_{rated}$), approx. 5 W holding power, approx. 16 W for heater			
Protection class	Class I (grounded)			
Angle of rotation and indication	95° incl. $\sim 5^\circ$ pretension, mechanical value indication			
Working direction	Selectable by left/right mounting to the damper/valve shaft			
Motor running times	40 / 60 / 90 / 120 / 150 s/90° selectable on site			
Motor	Brushless DC motor			
Spring return (F)	without F	without F	spring return in the event of loss of power	
Spring return running time (F)	without F	without F	spring return ~ 20 s/90°	
Safety operations	min. 10,000 in acc. with construction of damper and ambient			
Response time spring return	up to 1 sec. after power failure			
Control mode Y	3-pos., 0...10 VDC, 4...20 mA in acc. with wiring, selectable on site. Galvanic separation between supply and Y-signal			
Feedback signal U	0...10 VDC, 4...20 mA in acc. with wiring, selectable on site, both signals are available at the same time			
Resistance of Y and U signals	Input signal: U_Y 0...10 VDC at 10 k Ω , Y_1 4...20 mA at 100 Ω . Feedback signal: U_U 0...10 VDC at 2.000... ∞ Ω , U_1 4...20 mA at 0...800 Ω			
Reverse function	Bridge between wiring 3 and 4 (signal wise) gets a reverse function of Y and U			
Compulsion control	In modulation mode an On-off compulsion control can be performed by external connection /wiring independently from the modulating signal			
Adjustment of Y and U	In case of external mechanical limitation of the angle of rotation, it is possible to perform an adjustment drive started by touching the button			
Axle of the actuator	Double square 16 x 16 mm, direct coupling, 100 % overload protected			
Electrical connection	2 cable glands each ~ 1 m, wire cross section 0.5 mm ² , equipotential bonding 4 mm ² . Connections in hazardous areas require an Ex-e terminal box!			
Diameter of cable	$\sim \varnothing 7.1 + 7.4$ mm	$\sim \varnothing 7.1 + 7.4$ mm	$\sim \varnothing 7.1 + 7.4$ mm	$\sim \varnothing 7.1 + 7.4$ mm
Cable gland	M16 x 1.5 mm			
Manual override	Use delivered socket wrench, max. 4 Nm			
Integral heater	Integral, controlled heater for ambient temperature down to -40°C			
Housing material	Aluminium die-cast housing, coated. Optional with seawater resistant coating (...-CTM)			
Dimensions (L x W x H)	288 x 149 x 116 mm, for diagrams see ① Extra information			
Weight	$\sim 9,5$ kg			
Ambients	Storage temperature $-40...+70^\circ\text{C}$, working temperature $-40...+40^\circ\text{C}$ at T6 and $-40...+50^\circ\text{C}$ at T5			
Humidity	0...90 % rH, non condensing			
Operation mode	100 % of ED are permitted (ED = duty cycle)			
Accuracy electrically	~ 100 steps			
Self adjustment	If you select 40 sec. or 60 sec. mode for motor running time or rotation angle $< 90^\circ$ you need to start the self adjustment mode			
Maintenance	Maintenance free relative to function, maintenance must comply with regional standards, rules and regulations			
Wiring diagrams	SB 4.0 / 4.1	SB 4.0 / 4.1	SB 4.0 / 4.1	SB 4.0 / 4.1
Scope of delivery	Actuator with 2 x 1 m cable, 4 screws M8 x 140 mm, 4 nuts M8, Allen key for simple manual override			
Parameter at delivery	50 Nm, 90 s/90°	100 Nm, 90 s/90°	30 Nm, 90 s/90°	50 Nm, 90 s/90°

Approbations

ATEX directive	2014/34/EU
EC type-approved	PTB 04 ATEX 1028 X
IECEX certified	IECEX PTB 07.0057X
Approval for gas	II 2 (1) G Ex d [ia] IIC T6, T5
Approval for dust	II 2 (1) D Ex tD [iaD] A21 IP66 T80, T95°C
CE identification	CE № 0158
EMC directive	2014/30/EU
Low voltage directive	2014/35/EU
Enclosure protection	IP66 in acc. with EN 60529

Special solutions and accessories

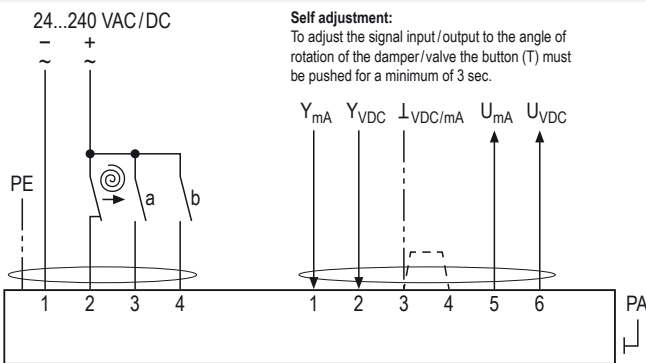
...-CTM	Types in aluminium housing with seawater resistant coating, parts nickel-plated
VAMH	Casing in VA for ...Max actuators size M
ExBox-Y/S...	Ex-e terminal boxes for zone 1, 2, 21, 22
MKK-M	Mounting bracket for boxes type ...Box... directly on actuator
ExSwitch	2 external aux. switches, adjustable for zone 1, 2, 21, 22
HV-MK	Comfortable manual override for ...Max actuators size M
AR-16-xx	Reduction part for 16 mm square connection to 14 or 12 mm shafts
Kit-S8	Cable glands nickel-plated
Adaptions	for dampers and valves on request



Electrical connection

All actuators are equipped with a universal supply unit working at a voltage range from 24...240 VAC/DC. The supply unit is self adjusting to the connected voltage!
 The safety operation of the spring return function works if the supply voltage is cut.
 For electrical connection inside hazardous areas an Ex-e terminal box, certificated in acc. with ATEX is required (e.g. ExBox).
 An over-current protection fuse < 10 A has to be provided by installer.
 Note: the initial current is appr. 2 A for 1 second.

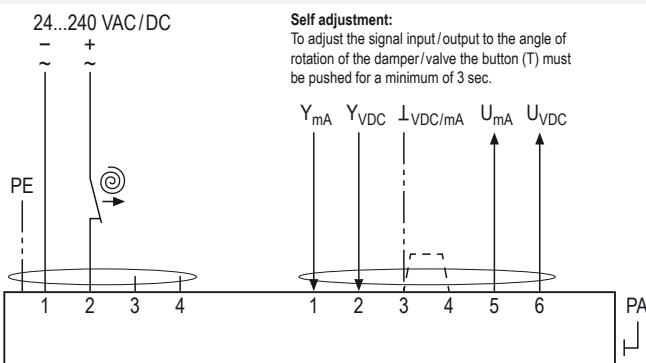
Modulating / 3-pos. – with / without spring return SB 4.0



Self adjustment:
 To adjust the signal input/output to the angle of rotation of the damper/valve the button (T) must be pushed for a minimum of 3 sec.

- Function and enforcement control of switch a and b in modulating mode:**
- a closed – **Forced-ON (OFF)** in acc. to left/right mounting of actuator
 - b closed – **Forced-OFF (ON)** in acc. to left/right mounting of actuator
- Reverse function:**
 Bridge 3–4 reverses the input and output signals

Modulating – with / without spring return (no enforcement) SB 4.1



Self adjustment:
 To adjust the signal input/output to the angle of rotation of the damper/valve the button (T) must be pushed for a minimum of 3 sec.

Reverse function:
 Bridge 3–4 reverses the input and output signals

Installation

Ex area –
 zone 1, 2, 21, 22



Safe area



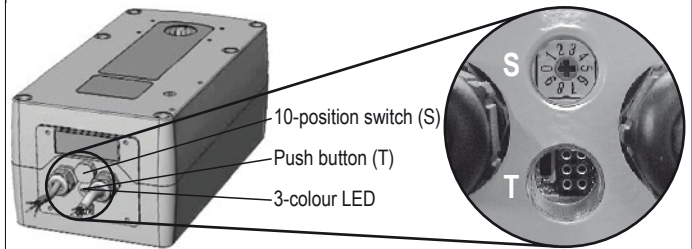
ExBox

supply*
 24...240 VAC/DC ± 10 %

* electrical wiring see diagrams

Parameters, adjustments and failure indication

Switch – Push button – Lamp for adjustment (behind the blanking plug)



Parameter selection

Example:
 ExMax-50.75-Y

Requested parameter:
 Torque 75 N
 Motor running time 90 s/90°

Type	Torques	
ExMax- 50.75-Y	50 N	75 N
ExMax-100-Y	100 N	
ExMax- 30-YF	30 N	
ExMax- 50-YF	50 N	

Running times	Position of switch (S)	
40 s/90°	00	05
60 s/90°	01	06
90 s/90°	02	07
120 s/90°	03	08
150 s/90°	04	09

Result:
 Switch position **07**

Functions, adjustments and parameters

A) Self adjustment of angle of rotation:

Switch (S) into position 02 (low torque) or 07 (high torque), then push button (T) for minimum 3 seconds. The actuator will drive into both end positions to be adjusted. LED indicates GREEN.

Adjustment time needs approx. 180 sec. (90 sec. "On", 90 sec. "Off"). After that, switch (S) into the position acc. with your required torque and running time.

B) Selection of running time and torque:

Put switch (S) into the correct selected position in acc. to above table. The selected parameter will work at next operation of the actuator. Adjustment can be done even without supply voltage. If supply voltage is available turn switch only if actuator is not running.

C) Changing modulating mode into 3-pos. operation mode with feedback:

Push button (T) 3 times.
 LED changes from permanent GREEN to permanent YELLOW.
 Push button within following limits:

- Push for min. 0,2 sec. each
- Complete pushing (3 ×) within 5 sec.

LED – Status:

- GREEN (permanent) – Supply available, actuator is active in modulating mode
- YELLOW (permanent) – Supply available, actuator is active in 3-pos. (+ U) mode

D) Changing 3-pos. mode with feedback into modulating operation mode:

Push button (T) 3 ×. LED changes from permanent YELLOW to permanent GREEN.

E) Additional information for 3-pos. operation:

- a closed, b open = direction I
- b closed, a open = direction II
- a and b closed = motor doesn't work
- a and b opened = motor doesn't work

The rotation direction (I and II) depends on left/right mounting of the actuator to the damper/valve. You can change direction of the motor by changing electrical wiring of terminal 3 and 4. In this case the Y-inputs are without function.

F) Reverse function:

Bridge between signal wise wiring 3–4 (cable B) gets a reverse function of input Y and feedback signals U.



Attention

During commissioning apply a self adjustment drive.
 Regard duty cycle at motor running times!
 Never use spring return actuators without external load.



Important information for installation and operation

A. Installation, commissioning, maintenance

All national and international standards, rules and regulations for hazardous Ex-areas must be complied. Certified apparatus must be installed in accordance with manufacturer instructions. If the equipment is used in a manner not specified by the manufacturer, the safety protection provided by the equipment may be impaired. For electrical installations design, selection and erection, EN/IEC 60079-14 can be used.

For electrical connection an Ex-e terminal box is required (e.g. ExBox-...).

Attention: If the actuator is put out of operation all Ex rules and regulations must be applied. You have to cut the supply voltage before opening the terminal box!

The cables of the actuator must be installed in a fixed position and protected against mechanical and thermal damage. Connect potential earth. Avoid temperature transfer from armature to actuator! Close all openings with min. IP66.

For outdoor installation a protective weather shield against sun, rain and snow should be applied to the actuator as well as a constant supply at terminal 1 and 2 for the integral heater.

Actuators are maintenance free. An annual inspection is recommended. For electrical installations inspection and maintenance, EN/IEC 60079-17 can be used. Ex-actuators must not be opened by the customer.

B. Manual override

Manual override only if supply voltage is cut. Use delivered socket wrench with slow motions, usage can be tight.

Attention: Releasing or letting go the Allen key too fast at manual operating actuators with spring return causes risk of injury!

C. Shaft connection, selection of running time

Actuators are equipped with a direct coupling double square shaft connection of 16 x 16 mm. The housing of the actuator is axially symmetrically built to select Open-close direction of the spring return function by left-right mounting. Using the 10-position switch different motor running times and spring return running times can be selected on site in acc. to the actuator type.

D. 3-position control mode

...Max actuators are in the best way suitable for the 3-pos. operation. To protect such elements as gears and mounting elements against harmful influences like minimum pulse time, ...Max actuators are protected via internal electronics. It ignores impulses < 0,5 s, the cyclic duration must be min. 0,5 s. At changing direction the pause is 1 s.

E. Spring return

Spring return function works only if the supply voltage for terminal 1 or 2 is cut. In the event of an electrical interruption, the spring returns to its end position even if supply voltage is available again during return function. Thereafter operation will continue.

F. Operation at ambient temperatures below -20 °C

All actuators are equipped with a regulated integrated heating device designed for employments down to -40 °C ambient temperature. The heater will be supplied automatically by connecting the constant voltage supply on the clamps 1 and 2.

1. After mounting the actuator must be immediately electrically connected.
2. The heater switches on automatically when actuator reaches internally -20 °C. It heats up the actuator to a proper working temperature, then heater switches off automatically. Actuator will not run during heating process.
3. The adjustment options are only ensured after this heating up period.

G. Excess temperatures

In acc. to the ATEX rules and regulations Ex actuators must be protected against excess temperature. The internal thermostat works as a maximum limiter and, in the event of failure at incorrect temperatures, shuts off the actuator irreversible. An upstream connected temperature sensor stops the actuator before reaching its max. temperature. This safety feature is reversible, after cooling down the actuator is completely functional again. In this case the failure must be eliminated immediately on site!

H. Synchron mode

Do not connect several actuators to one shaft or link mechanically together.

I. Mechanical protection

The actuator must be operated with an outside load of at least 10 Nm.

After installing the actuator to the damper/armature an automatic alignment has to be accomplished in order to obtain a "gentle" blockade/stop. This function protects the damper/armature by reducing the end position's/blockade speed in order to avoid mechanical overload. The actuator aligns specifically once with 90 s/90° onto each position and recognizes the blockade position in order to reduce the motor performance during operation briefly before reaching the end/blockade position.

J. Intrinsically safe circuits

The actuator itself has a flameproof enclosure. The supply of the push button (adjustment drive), the 10-position switch (adjustment of torque and running time) and the LED indicator is performed intrinsically safe!

Extra information (see additional data sheet)

Additional technical information, dimensions, installation instruction, illustration and failure indication

Accessory ExSwitch – adaptable Ex-d auxiliary switch



For an end or inclined position indication it is possible to retrofit external, adjustable, explosion proof auxiliary switches type ExSwitch. The switch housing is mounted directly to the actuator and the switches are linked to the actuator's square connector. The switches deliver a potential free output and can be adjusted separately. They are connected by the included cable tail.

Accessory ExBox – adaptable Ex-e terminal box



For electrical connection of ...Max actuators inside the hazardous area an Ex-e terminal box is required. ExBoxes are appropriate terminal boxes and placed at the disposal. To adapt the ...Box directly to the actuator housing a mounting bracket type MKK-M is required.
ExBox- Y/S for ...Max-...-Y and ...-YF with integral auxiliary switches